# MAT 243 Project Two Summary Report

Jared Baker

Jared.baker@snhu.edu

Southern New Hampshire University

## Introduction: Problem Statement

The problem I am going to solve is whether or not certain claims being made about my team are statistically significant. The data set I am using contains historical statistics of NBA teams. The statistical methods I will use in my analysis are hypothesis testing for the mean, proportion and difference in means. Hypothesis testing involves evaluating whether a null hypothesis is accurate, or statistically significant.

## Introduction: Your Team and the Assigned Team

Table 1. Information on the Teams

|  | **Name of Team** | **Years Picked** |
| --- | --- | --- |
| 1. Yours | Nuggets | 2013-2015 |
| 2. Assigned | Bulls | 1996-1998 |

## Hypothesis Test for the Population Mean (I)

Hypothesis testing is used to test if a null hypothesis should be considered true or false by mathmatically testing if the delta between variables is statistically significant. The null hypothesis is the hypothesis that is considered true unless we can prove otherwise. In this case, the null hypothesis is that our team’s relative skill level is 1340. The alternative hypothesis is that our team’s relative skill level is higher than 1340 (Right tailed hypothesis). The level of significance we are testing with is 5%, or 0.05. With this level of significance (alpha), if the resulting p-value is less than 0.05, then the null hypothesis is rejected.

| **Statistic** | **Value** |
| --- | --- |
| Null Hypothesis | Average relative skill of the Nuggets was greater than 1340 from 2013-2015. |
| Alternative Hypothesis | Average relative skill of the Nuggets was less than or equal to 1340 from 2013-2015. |
| Test Statistic | 33.95 |
| P-value | 0.0000 |
| Alpha threshold | 5% |
| Decision | Reject Null Hypothesis |
| Conclusion | The difference in the relative skill level being 1527.03 is considered statistically significant with a p-value of 0. In practical terms, this test shows the coaches that their team does in face have a higher relative skill level than what is considered critically low. |

## Hypothesis Test for the Population Mean (II)

This test was performed using the same 1 sample ttest from the previous step, but for points scored instead of elo. The null hypothesis is that our team scored an average of less than 106 points per game from 2013-2015. The alternative hypothesis is that the team scored an average of 106 or more points per game. The level of significance we are using for this test is 1% (0.01). The resulting p-value is 0.0115. Because the p-value is greater than the level of significance, we cannot reject the null hypothesis.

Table 3: Hypothesis Test for the Population Mean (II)

| **Statistic** | **Value** |
| --- | --- |
| Null Hypothesis | The Nuggets scored less than an average of 106 points per game from 2013-2015. |
| Alternative Hypothesis | The Nuggets scored at least an average of 106 points per game from 2013-2015. |
| Test Statistic | -2.55 |
| P-value | 0.0115 |
| Alpha threshold | 1% |
| Decision | Do not reject Null Hypothesis |
| Conclusion | The mean points scored was 104.0, and this is not a large enough difference to be considered statistically significant. The practical significance of this test is that the coaches know that their team is likely to do well during the regular season. |

## Hypothesis Test for the Population Proportion

* 1. Hypothesis testing for a proportion involves multiple variables for the numerator and denominator of the proportion. In this case, we are testing the null hypothesis that our team wins 90% of games in which we score 102 or more points. The alternative hypothesis would be that we win more or less than 90% of games with 102+ points. The level of significance we are using is 5% (0.05). The result is that the Nuggets win ~65.9% of games in which they score 102 or more points.

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Null Hypothesis | The Nuggets won 90% of games in which they scored 102+ points from 2013-2015. |
| Alternative Hypothesis | The Nuggets did not win 90% of games in which they scored 102+ points from 2013-2015. |
| Test Statistic | -9.32 |
| P-value | 0.0000 |
| Alpha threshold | 5% |
| Decision | Reject Null Hypothesis |
| Conclusion | The resulting p-value of the test is 0, making the difference statistically significant and rejecting the null hypothesis. The pracitcal significance of this is that the coaches know that their claim that the team wins 90% of games with 102+ points is false. |

## Hypothesis Test for the Difference Between Two Population Means

* 1. This hypothesis test is comparing the difference between the mean relative skill of the assigned team and our team. The test assesses the statistical significance of the difference between the means of our two datasets using statistical algorithms. The null hypothesis is that the skill levels are equal. The alternative hypothesis is that the team’s skill levels are different. The level of significance we are using is 1% (0.01). The result of the test shows that the mean skill level of the Bulls is 1739.8, and the mean skill level of the Nuggets is 1527.03.

Table 5: Hypothesis Test for the Difference Between Two Population Means

| **Statistic** | **Value** |
| --- | --- |
| Null Hypothesis | The Nuggets from 2013-2015 had the same skill level as the Bulls from 1996-1998. |
| Alternative Hypothesis | The Nuggets from 2013-2015 had a different skill level as the Bulls from 1996-1998. |
| Test Statistic | 33.18 |
| P-value | 0.0000 |
| Alpha threshold | 1% |
| Decision | Reject Null Hypothesis |
| Conclusion | The p-value is 0.0, which is less than 0.01. This shows that the difference is statistically significant, so the null hypothesis is rejected. The practical significane of this test is that the coaches know that the two teams are not equally skilled. Specifically, the nuggets in 2013-2015 were not as good as the Bulls in 1996-1998. |

## Conclusion

The practical importance of the analyses performed is that it gives insight as to how these two teams in their respective eras compared to each other. We can statistically prove that the Nuggets did not have a low relatively skill level, did not score at an average of less than 106 points, did not win 90% of games scoring at least 102 points, and do not have the same skill level as the Bulls. Hypothesis testing allows a way to mathmatically assess the validity of claims about a dataset with as much certainty as is required.